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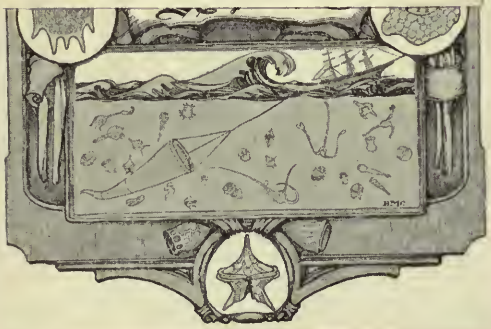

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Report

ON ANKYLOSTOMIASIS

IN ANTIGUA

BY

E. S. MARSHALL, M.R.C.S., L.R.C.P., D.T.M. & H.

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REPORT

ON ANKYLOSTOMIASIS IN ANTIGUA.

ANTIGUA,
B. W. I.,
November, 26th., 1914.

Your Excellency,

I have the honour to report to you on the prevalence of Ankylostomiasis in Antigua and the degree to which it affects the Inhabitants and Labouring Classes.

The absence of Sanitary arrangements and conveniences is common throughout all the country districts, so that in this respect the whole Island outside the town area can be judged on much the same basis, and the actual distribution of the disease is thus entirely dependent on the climatic and soil conditions, influenced by drainage.

The Island is thus divided into three main areas :—

I. *The Lime Stone Area*, which lies roughly north of a line drawn from Corbison Point in the North West of St. John's to Willoughby Bay in the South East between St. Paul's and St. Philip's Parishes.

II. *The Central Plain* included between the line indicated and one passing from Oyster Bay South of Five Islands and following the Bendals Stream through to Sweets Village and the foothills north of Liberta and Grace Hill Village. Five Islands should be excluded from this.

III. *The Volcanic or Hill District* lies South of this line, and for this purpose should include all the lands south of it with the exception of the Falmouth and English Harbour District in St. Paul's Parish and Urlings and Johnson Point in St. Mary's Parish, all of which have lighter soil and a drier climate.

Owing to the smallness of the Island and the fact that the people in the course of work or business are continually moving from one district or Parish to another often sleeping in one district and working in some other, it is impossible to draw any hard and fast line and there must necessarily be a good deal of overlapping ; but the distribution according to the areas named is followed as far as possible.

The Report is based on the Examination of 2507 persons distributed throughout the Island, but 2714 is the Grand Total from which the percentages are estimated, 207 being double entries, e.g. Hospital Cases re-entered with the villages to which they belong and Factory hands re-entered with their respective villages, etc.

All persons aged 15 years and over are included with the adults, as the majority of the girls and boys begin to work on the fields at the age of fifteen, although in many cases poverty compels them to commence younger.

	Adults	1578		Under 15	1136
Re-entries	Adults	147	Re-entries	Under 15	60
	No. Examined	1431		No. Examined	1076

Total Examined 2507.

	Males	1478		Females	1236
Re-entries	Males	131	Re-entries	Females	76
	No. Examined	1347		No. Examined	1160

Total Examined 2507.

Rainfall. The average Rainfall througout the Island since the year 1874 varies from 28·78 inches in 1875 to 73·59 inches in 1889 while the total average since 1874 for a period of 38 years is 44·80 inches. Of this, the Lime Stone area which varies greatly in the distribution of its Rainfall may get anything from 32 to 50 inches while the Volcanic or Hill District has considerably the highest consistent rainfall of any between 40 and 60 inches with as much as 90 inches at one place in this District in 1889.

The Central Plain is intermediate in its average rainfall.

Soil Conditions. Throughout the *Lime Stone Area* the Soil is light and marly with a high percentage of Calcium Carbonate, and as a result the surface water is readily absorbed and the drainage is good so that the conditions are unfavourable for the development of the Ankylostome larvae.

The Central Plain consists almost entirely of heavy clay soil and should include the whole of the Town area, but the Five Islands peninsular which has a much lighter and more porous soil should not be included.

The Volcanic Area. The soil of the Volcanic Area is fairly consistent throughout that district in the high percentage of Agricultural Clay, the heaviest being at Bendals, Greencastle, Monteros and Tottenham Park, becoming lighter at Claremont while at Cades Bay the Physical Analysis shows 23·3% Fine Silt and Clay, 17·27% Medium Sand, 8% Gravel, and with the lightening of the soil the percentage of Ankylostome infection decreases and disappears.

In the Lime Stone District the percentages are drawn from 31 Estates and Villages throughout that district, the result of the examination of 547 individuals. 11·1% of the adults (over 15 years of age) are infected, but some of these work in the Central Plain while two out of three infected cases at Montpelier could be traced to St. Lucia and Dominica.

"Ground Itch" or "Water Fat" is very rare, few people admitting having suffered from it while many are not aware of its presence amongst them. This is especially evident in St. Philip's Parish and in the North of St. John's Parish which would account for the low percentage, and in some cases the absence, of any infection.

Number Examined	547.		
Number Infected	36.	Males Infected	8·5%
Adults Infected	11·1%	Females Infected	4·33%
Under 15 Infected	2·71%		
Total Infected	6·5%		

Central Plain. Eleven Estates or Villages are included in this District, Freemanville and Lebanon showing the lowest Adult percentage of infection and Delaps which is heavy clay soil, low lying with a badly drained Gut running through the centre of the Estate, is by far the most heavily infected with an Adult percentage of 37·9%. The average Adult Infection throughout this district is 19·1%. The disease is sufficiently prevalent in this district to affect the Planter, for the opportunities for the reinfection of Labourers are far more favourable than in the Lime Stone District and the disease is more regularly distributed throughout the whole of the Central Plain with the exception of Five Islands where no sign of the disease was found and this is probably due to the lighter soil. Of the rainfall here I have no information. Many of the people in this district are fishermen. (Five Islands.)

Number Examined	689		
Number Infected	84	Males Infected	13·19%
Adults Infected	19·1%	Females Infected	10·9%
Under 15 Infected	5·4%		
Total Infected	12·19%		

The Volcanic Area or Hill District which comprises the whole of St. Mary's Parish and the South East portion of St. John's and St. Paul's Parish is the centre of the disease in Antigua. Throughout this district the majority of the people work on their own "nigger holdings" while there are comparatively few estates. Of the larger centres Liberta Bolans and Jennings are the most heavily infected and the most marked feature in this district is the increased percentage amongst children under 15 years old.

"Ground Itch" or "Water Fat" is commonly admitted, and the women frequently complain that they get it while standing in the water washing clothes and consequently often stand on stones in the ponds or guts in order to avoid it. Many of the adults both men and women when able to do so wear boots and recognize a subsequent improvement in their health. In this area 10 Estates Villages or groups of Villages were examined, and from 25 to 58% of the adults were found to be infected giving an average percentage of 50·47% while10% to27% of the children were infected.

From the *Volcanic Area* I have excluded the Falmouth and English Harbour district and a strip of land between Morris Old Mill and Fryes Point where the absence of the disease may be accounted for partly by soil conditions and the smaller rainfall and partly by the fact that many of the inhabitants are fishermen, though at the same time they cultivate their nigger grounds.

It is of interest that several people in this district were found to be infected with the Lateral Spinal Schistosome or Schistosomum Mansoni and the majority were cases of Ankylostome infection also. This Trematode had not, I believe, previously been reported in Antigua, one case was found in the town area but he was at one time resident in Liberta.

In this, as in every district outside the town limits, no Sanitary arrangements of any kind exist, but here and there a better class house may have its own private latrine.

This entire absence of Sanitary Laws or Regulations accounts for the dirty habits of the Antiguan negro and fosters the spread of Ankylostomiasis.

Number Examined 486
Number Infected 156
Adults Infected 50·47% Males Infected 34·59%
Under 15 years Infected 17·87% Females Infected 30·19%
Total % of the infected 32·09%

Under *Public Institutions* I have included the Prison, Poor House, Industrial School, Hospital and Lunatic Asylum.

All except the Poor House show a fairly high average percentage of infection and I have no doubt that in the case of the prisoners, Industrial School boys and inmates of the Lunatic Asylum, all of whom live under properly regulated Sanitary conditions, every one of those found to be infected were so before entry into any of these institutions, and that under their present conditions of living and working it is extremely unlikely and in many cases, especially those in the Asylum, it is quite impossible for them to have become infected since entry. In some cases the infection may have been present for 10 or 12 years.

With regard to the Poor House, the majority of whose inmates are between the ages of 50 and 80, it is unlikely that so large a number in their station of life have lived up to the present age without ever having become infected, but probably at some period or other of their existence they have contracted the disease but not to a sufficient degree to kill them, so that after being infected for a period of years the worms have died a natural death, and in many cases possibly leaving their victims in an indifferent state of health from which they have subsequently recovered.

Out of 247 patients admitted to the Hospital for various complaints and who were examined by me for Ankylostomiasis 24·29% of the Males and 24·28% of the Females were found to be infected. This gives a total percentage of Hospital patients suffering from Ankylostomiasis as 24·33% of all admissions and it is possible that many subsequent and intercurrent diseases are fostered and engendered by the lowered vitality caused by a primary Ankylostomiasis.

In the *Lunatic Asylum* 10 cases examined from each of the Presidencies of Dominica, Montserrat, St. Kitts and Antigua gave a 50% infection in all except Montserrat which was 60%. The Total Percentage was subsequently lowered to 45·8% by an examination of more Antigua Inmates.

Public Institutions,

Number Examined	496		
Number Infected	119		
Adults Infected	22·76%	Males Infected	25·9%
Under 15 Infected	28·57%	Females Infected	21·8%
Total Infected	23·9o/o		

Under *St. John's Local Cases* 158 persons were examined in addition to 221 boys examined at Bishop Mather's School.

Of the St. John's cases 6·9o/o were found to be infected, but purely local cases who disclaimed any residential association with any infected districts the percentage was only 2·5o/o.

Local Cases.

Out of the 221 examined at Bishop Mather's School 2·26o/o were infected

Number Examined	158		
Number Infected	11		
Adults Infected	8·47o/o	Males Infected	7·3o/o
Under 15 Infected	2·5 o/o	Females Infected	6·6o/o
Total Infected	6·9o/o		
Purely Local	2·5o/o		

PREVALENCE AND INTENSITY OF THE DISEASE AS AN ECONOMIC FACTOR.

In the Lime Stone or Calcareous Area which consists of the North-west corner of St. John's and the Northern part of St. George's, St. Peter's and St Philip's Parishes, all of which are extensive cane planting districts, the disease under the present order of things is never likely to be of any Economic Importance and can never seriously affect the labour output and as the labour employed on these estates is largely drawn from local resources and is only occasionally recruited from outlying and more infected districts during the crop season, the Planters in these districts are not likely to appreciate or recognize any benefits from a campaign which has as an object the complete eradication of the disease in those districts.

In the Central Plain which runs from North-west to South-east the heavier nature of the soil together with a slightly heavier average rainfall raises questions which more seriously affect the Planter. At the present time the disease is not of a serious nature and only infects about 19o/o of the labouring population and the labour output of those infected is not greatly diminished in the majority of cases, but owing to the existing rainfall and clay soil the disease is far more likely to thrive here than in the Lime Stone area and given a succession of wet seasons the health of the population would be more seriously affected and the district itself would be a danger to the Northern Parishes in that continual reinfection would take place especially during crop season, with always the liability that the ponds in those parishes might become more polluted.

Complete eradication would not benefit the Planter to quite the extent that the percentage of infection suggests for many of those infected show no more clinical signs of the disease than some of their so called healthy neighbours.

If at any time it was decided to establish a system of damming to irrigate the lands in the lime stone area and central plain, the disease unless effectively dealt with would at once become a menace, for the successions of dry months which frequently occur and which are the natural means of preventing its spread, by drying up the ponds and baking the surface soil, are at once removed, and with it "Ground itch" or "Water fat" would increase and the chances of reinfection would be increased from the rarer intervals during which it is now possible to become reinfected, to any time during the year.

The situation however is quite different in the *Volcanic Area.* The soil in the valleys and low land is for the most part heavy clay and the average rainfall throughout the district is heavier than any other district in the island, with the exception of the coast land on the south side, which is dry. The prevalence and intensity of the disease in this district, which includes such labour centres as Liberta, Sweets, Ebenezer, Jennings, Bolans, Blubber Valley, Bendals, Hamilton, Brecknock, Sawcolts, John Hughes, Bishops etc. is at the present time a serious menace to the health of the population and economically is of some importance. The Population in this district is infected to between 25 and 58*o/o* and the efficiency of the labourers is proportionately affected.

Nearly the whole of this district is the chief centre for the "nigger holdings" and the majority of the labouring class work on their own grounds and only during crop season do they seek employment in plantations outside their own immediate neighbourhood.

For this reason the general inefficiency has for the most part escaped the notice of the planters as comparatively few estates are seriously affected, the chief however being Bendals Factory and Belvidere Estate, Jolly Hill and Blubber Valley Estates, Christian Valley and Cooks Hill. Amongst the people themselves there is very little desire at present to avail themselves of the opportunities for examination and treatment afforded them, but, as the benefits become more apparent and the results of treatment more evident, some of the prejudice which now exists will disappear but there will always be a certain number of laggards whose dispositions and lack of intelligence will make them passive resisters.

RESULT OF BLOOD EXAMINATIONS AND CONCLUSIONS DRAWN THEREFROM.

The degree of Anaemia produced amongst the negro labourers is in the majority of cases not a severe one, but in a few instances it was very profound, and in one case was the direct cause of death. A very large number of cases showed no more anæmia than many of those who were uninfected and their physical condition was not below that of their so called healthy neighbours. The primary effect of the disease on the negro is mental rather than physical and this is the most marked feature of the disease in Antigua for many cases are not physically inefficient but are none the less inefficient owing to the dull mental condition produced by the disease and the desire to do as little work as is compatible with their existence. In all, 284 Blood Examinations were made, which were either "Complete" consisting of :

(*a*) Haemoglobin Estimations ;
(*b*) Total Red and White Counts ;
(*c*) Differential Counts or else "Partial Examinations consisting of one or other, according to the condition of the patient and the opportunities afforded for examination.

These Comprised

(*a*) Haemoglobins of Infected persons	259
,, of Uninfected persons	15
(*b*) Total Blood Counts	90
(*c*) Differential Counts	80

The results of these are shown in *Table C.*

The most marked result of the Haemoglobin estimation is the fall in the percentage of Haemoglobin which primarily is much more marked than the disease of Red Cells as shown by the "Total Count."

In three cases the Haemoglobin present was between 10 and 20*o/o* or almost unregisterable.

In one of these death occurred from Syncope before any treatment was possible. Of the remaining two one is a child of 1 year and 5 months old and is making good progress whilst the other is a youth of 19 who is still under treatment.

Of the 90 *Total Counts* 76.6*o/o* showed no marked fall in the number of Red Cells and were between 4&5 million per Cubic millimeter. The Lowest Count was that of the afore mentioned case which died of Syncope, the Red Cells being reduced to 1,770,000 per Cmm.

In all 80 *Differential Counts* were done, the highest average counts being in the "Volcanic Area" where 15 cases averaged 12·93*o/o*.

Treatment of Infected Cases. The treatment of infected cases was not on the original programme of the investigation but as the treatment of cases when possible would serve as an example to others, Dr. McDonald kindly placed at my disposal 5 to 8 beds at the Hospital whenever available. Of the 2507 persons examined 359 were found to be infected. Of these 231 or 64·34*o/o* availed themselves of the offer of free treatment and for this purpose had to come into Hospital a distance of anything from 1 to 15 miles.

The following treatments were given

One treatment	195 cases
Two treatments	31 ,,
Three treatments	4 ,,
Four treatments	1 case.
Total	231

Out of these three Emigrants were certified as cured, three died, one from Syncope the direct cause being Ankylostomiasis, one from Pellagra Malignant growth of Caecum and Ankylostomiasis, and the third died from Dysentery a few weeks after he had been entirely rid of Ankylostomes for which he had been under treatment previous to my arrival.

The remainder have been offered free treatment until cured and slowly continue to come into the Hospital for Second and Third treatments.

If any intensive Campaign for complete eradication was initiated and the same measures adopted for house to house treatment as has recently proved so successful in British Guiana, many of the present difficulties and prejudices connected with Hospital treatment would be eliminated and the risk incurred appears to be theoretical rather than practical.

ATTITUDE OF THE LABOURING CLASSES.

When dealing with Ankylostomiasis in Antigua the exceptional conditions under which it exists call for exceptional measures in order to obtain satisfactory results.

In initiating a campaign for the *complete* eradication of the disease the necessary measures called for, owing to the existing conditions, will not at first make the campaign a popular one, but I do not think it will meet with any more opposition than if it were left to the will of the people while the results obtained will be far in excess of anything possible under any other methods and instead of the expenditure of a considerable sum of money over an indefinite number of years with the possibility of very unsatisfactory results at the end of that period it will ensure the best possible results and an expenditure of a definite sum within a specified time limit.

These measures are necessary owing to :—

1. The almost entire lack of serious cases, which when treated would serve as striking examples of what is to be acheived by treatment, except in a few isolated instances which are so few and far between that they would never serve that purpose, yet at the same time the health and condition of the people would be greatly improved.

2. The condition into which the people have sunk is one of the utmost

indifference and apathy regarding their own welfare, and because the Hookworm has been amongst them in the past they see no necessity for eradicating it at the present time. This condition of mind and lack of ambition or desire to do anything but exist under their present conditions is fostered to a great extent by the high percentage of Ankylostomiasis amongst them, which always keeps them below par, reducing their vitality and resistance to other diseases and making them inferior in intelligence and physique to the labourers in the less infected districts and consequently less able and desirous of cultivating the large areas of undeveloped land still available in their districts. In ridding the island of Ankylostomiasis the first step would be taken towards improving the condition of the Agricultural class and increasing its efficiency.

Unless this is done for them and possibly against their will, it will never be done at all and the labourer will remain in the present low state to which he has sunk.

In order to effectively cope with this state of things it will be necessary to make examination and treatment as much compulsory as vaccination is at the present time, and the law must apply equally to all classes and colour, for though it may concern one more than the other, it is impossible to distinguish between the two and so raise class and colour distinctions. Amongst intelligent people I do not think that any opposition would arise, for they would realise that, unless the question is effectively dealt with, it had better be left alone, and that half results only leave the island in exactly the same state as before, but with the additional stigma that much time and a considerable amount of money has not only been spent to no purpose but it would also associate the island with failure, and leave it very much worse off than if it had never been commenced.

For these reasons I am of opinion that compulsory examination and treatment is the only effective way of dealing with it in Antigua, for those who are intelligent enough to realize and appreciate the benefits, will willingly come in, while it will serve as a much needed and effective stimulus to a large number who would otherwise hamper the progress and possibly ruin the final results.

Emphasis need not be made on the "Compulsion" except when necessary, while every effort should continue to be made to educate the people in the dangers of "Hook Worm," and the advantages of sanitary preventative measures. In this respect the School Masters could materially assist.

When recommending "Compulsion" I have in view 100% results and complete eradications.

E. S. MARSHALL.

PROPHYLAXIS AND ERADICATION OF ANKYLOSTOMIASIS IN ANTIGUA.

1. In the *Central Plain and Volcanic Area* each village or group of villages should be systematically dealt with commencing in the more heavily infected villages in the cane planting area, and, Jennings and Bolans Villages being heavily infected and being the source of supply of a considerable amount of labour for the surrounding estates, the result obtained would serve as an example for further work. (Including Roses and Blubber Valley.)

2. Efforts should be made to examine and treat where infected every man woman and child in the villages until they are pronounced free from infection.

3. Latrines of a suitable pattern should be erected in each village and these should be placed as conveniently near to the houses as possible. The type of Latrine should be carefully considered, for unless it is suitable and of a convenient nature the people will never be induced to use them. I would suggest a screened shelter with a concrete bed and gutter. A series of low trestles supporting a wooden bar or pole about 4 inches in diameter should run the whole length of the shelter and about 30 inches apart movable buckets placed on the concrete bed. A wooden handrail should run the whole length of the shelter. The object of such a latrine is that the person using it may assume the same position as he is accustomed to when defecating in the bushes or canes, using the handrail as a support. The bucket contents should be emptied daily into a pit dug for the purpose and quicklimed or buried or else burned in a cheap form of incinerator.

4. The ground round the villages should be kept clear of bush and vegetation as far as it is possible so that the sun can thoroughly bake the ground. This would be impossible in many villages as the ground round the huts is planted with vegetables.

5. In many villages, especially in the hill districts, e.g. Jennings, Bolans, Hamilton, John Hughes, Liberta, etc. the water supply for drinking purposes is entirely drawn from ponds or " Streams " and especially in the case of the ponds is a source of danger and often infection to the inhabitants, as no special precautions are taken to prevent pollution of the ground round and consequent draining into the ponds. In such places a corrugated iron Catchwater and tank should be erected or pipes and stands laid on from Wallings.

6. Where ponds are not used for drinking purposes they are frequently used for bathing in or washing clothes and are often recognised by the inhabitants as a source of " Water fat " especially by the women who are accustomed to stand in the water while washing. This to some extent accounts for the women being as commonly infected as the men. Many of these ponds " dry up " at one period of the year, and if, when this occurs, they were cleaned and quicklimed what is, I think, a common source of infection would be removed especially if repeated for two consecutive years.

These measures would I think directly benefit the planter, for Oesophagostomiasis or Cattle Hook worm is most Common in the low lying wet districts, and it is possible that, although there is no connection between Oesophagostomiasis of cattle and Ankylostomiasis of man, yet the two diseases are favoured by similar conditions so that some of the prophylactic measures adopted for one may also serve to lessen the risk and prevalance of the other. The drying and cleaning of ponds would, I think, serve this purpose.

7. I am not in favour of erecting permanent Latrines on the estates for in Antigua I do not think the result would justify the expense, but the purpose would be equally if not better served by movable latrines and screens similar to those used by the Industrial School, which could be placed wherever a gang was at work and constant use would be more likely to ensure cleanliness. Some difficulty would be experienced in providing for the Contract Labourer who works independently at all times and places, but as he is a comparatively small source of infection first efforts should be made to deal with him and educate him up to the necessity for sanitary habits and if treated early that source of infection would be removed.

8. The "Guts" are in a general sense stagnant water for only after heavy rain is it running water and then only for a short time. The bushes and plantations on the banks of these guts are often favourite places to resort to, to "go aside," and are very liable to infection.

Women who are accustomed to stand in the shallows and wash clothes in the Jennings and Delaps Gut recognise places in these guts as a common source of infection for "Water fat." The flood water runs away over the roads while the drought water is dammed by the roads, but if culverts were built beneath the roads much of the drought water would drain away and complete drainage could be ensured by a Windmill Pump at the sea end, the wind would be sufficient to work it for the greater part of the year except perhaps during the wet season of September and October when the flood water would be sufficient to keep it properly flushed. The Delaps and Collins gut which enters the sea near Seaton village might well be drained in this way.

9. Ankylostomiasis in Antigua owing to its limited distribution as an important factor in the health of the population could, I think, with energetic and adequate measures be completely eradicated in two years, and allowing for unforeseen delays and difficulties three years should certainly see the work completed and the results reaped. The complete co-operation of the Planters is essential and they should assist the Government by making their labourers understand that when the campaign is extended to their estates all those who object or refuse to be examined or treated will be excluded from working on the estate until they have complied with the necessary regulations.

10. With complete eradication as the object in view the Medical Officer appointed should be capable of dealing energetically with the situation and should be without any previous local bias or sentiment.

11. It would be necessarry to set apart or construct a block at the Hospital containing not less than 20 beds properly staffed for the observation and treatment of Ankylostomiasis patients, the whole to be under the entire control of the Medical Officer in charge of the work.

12. Two trained Microscopists should be appointed to assist the Medical Officer in the systematic examination of all patients and specimens submitted. The nearest Laboratory from which such Microscopists could be obtained would be Trinidad.

13. In each village it would be necessary to appoint a local man as Inspector of Nuisances and in many districts such a person already exists. To ensure the proper carrying out of his duties he should be under the strictest supervision, and the Medical Officer in charge of the work, being the most frequent visitor to the infected district and the most intimately acquainted with the situation, he would be the best person to whom the Inspector should be made responsible. Mingo of Hamilton and Daniel Crogman of Liberta are both men who might be useful in their own villages.

14. An adequate travelling allowance should be made to the Medical Officer in charge so that he may not be handicapped in getting about the island and can keep constantly in touch with every branch of the work. This could only be efficiently performed by the use of a motor car.

15. From the commencement of a campaign for the complete eradication of the disease it would be necessary to take measures to prevent the entry or re-entry of infected persons into the island so that all persons coming into the Island will have to show a certificate from the Medical Officer of their port of departure certifying them free from infection. Anyone failing to do this should be refused admission or, if willing and able to pay for treatment, might be quarantined and treated until certified free from Ankylostome ova.

Re-entry after a visit to or stay in any of the other islands or mainland, should be treated in the same way as a first admission.

16. When dealing with the Lime Stone area i.e. all estates and villages in

the northern part of St. John's, St. George's, St. Peter's and St. Philip's parishes, latrines, although not so essentially necessary as in the other districts, are highly desirable and their use should be encouraged if possible. In every respect the same regulations should apply to this area, but their enforcement should be left to the discretion of the Medical Officer in charge of the work.

17. Throughout the island Ankylostomiasis should be made a notifiable disease.

18. *Effect of damming and an irrigation scheme on the General Health of the Island.*

An irrigation system would probably greatly improve the general welfare of the island and would be beneficial to the health of the people by making it possible to do away with the present system of ponds which are always a danger and often a source of sickness to the estate labourers by acting as breeding places for mosquitoes, and by harbouring the Ankylostome larvae and to the stock as a possible and likely means of infection of cattle Oesophagostomiasis.

If the ponds were filled in, under an irrigation scheme, the water could be run into tanks or troughs as required.

The present dry intervals during which the soil becomes baked hard, would change to a more or less continous dampness of the soil which would be favourable to the spread and development of the Ankolostome larvae, and hence would call for special repressive measures in this direction, but if an irrigation scheme followed a successful Ankylostomiasis Campaign then all danger of the spread of the disease and the menace to the health of the people would have been removed, and no risks would be run provided proper measures were taken to prevent reintroduction into the island.

SUPPLEMENTARY REPORT TO PROPHYLACTIC AND ERADICATION MEASURES.

3a. It has been found in British Guiana and elsewhere that although the concrete Latrine and bucket system is an ideal one, it is impracticable owing to the expense incurred in the erection of such latrines over a large district, so that the pit or trench system was instituted with highly satisfactory results, and that the water was not more contaminated than it had previously been. This would equally apply to Antigua for instead of the top soil becoming polluted as it has always been, the night-soil is confined to the ground and less risk would be incurred than has hitherto been the case. Owing to the prevalence of Venereal Disease in Antigua, and the possible fear of contracting it by a system of Public Latrines, it would be advisable to compel each hut or house to erect its own Latrine. The Latrine should consist of a hole 4ft. deep over which is placed a close fitting case or barrel with a hole in the top. Over the hole is fitted a cover and the whole should be made fly-proof. For those who refused to use a seat type and would prefer a squatting type, the same idea would equally apply save that the case covering the pit instead of having a hole cut in the top should have the middle plank removed to which can be fitted a cover to make it fly-proof as before.

As a Public Latrine on the roadside this type would be much more suitable and acceptable. As soon as the pit is filled to within 18 inches or 1ft. from the surface, another pit is dug alongside, the earth removed from this being used to fill in the other. The case or barrel is then placed over the newly dug pit.

The chief duty of the Sanitary Inspector will be to see that each hut erects its Latrine and uses it and the law should empower him to enforce this when necessary.

SUMMARY.

The physical deterioration of the Labouring Class in Antigua is probably due to two causes.

Throughout the island the men of the best physique and most initiative have for some years past been emigrating to America and Panama leaving behind the weaklings who are devoid of ambition or ability to improve their condition with the result that the island has been seriously affected and the labour market to some extent depleted of its best workmen.

In some districts however 50% of the adult population and 10 to 27% of the children are infected with Hook worm and in these districts it accounts for the mental and physical deterioration of the inhabitants who are below the standard of most of those in the North and South east villages and are lethargic, lazy and unambitious and indifferent regarding their own health and welfare, and without initiative or ability to do more than eke out their existence with the minimum expense of energy. For this, Ankylostomiasis is very largely responsible.

The results of the investigation show that

1. In certain districts a large percentage of the population are suffering from Ankylostomiasis.
2. That it is the cause of much sickness at the present time.
3. That under certain conditions it might become a menace to the health of the whole island.
4. That at the present time owing to its distribution it can be readily dealt with by an Intensive Campaign.
5. That it is in some districts of considerable economic importance to the Planters.
6. That it is of vital importance to a large percentage of the labouring population.

Throughout the course of the Investigation I have been helped by the ready co-operation of some of the Planters, Clergy and Schoolmasters and the Officials of the Public Institutions and to these I am greatly indebted, also to Dr. Tempany for placing at my disposal the rainfall records and soil and water analysis, and to Dr. Oliphant and Dr. Duke for propagating and assisting the Investigation in the Town Area.

I have the honour to be, Sir,

Your Obedient Servant,

ERIC S. MARSHALL,
M.R.C.S., L.R.C.P., D.T.M & H.

His Excellency
Sir Hesketh Bell, K.C.M.G.
Governor,
Leeward Islands,
B.W. Indies.

ALTERNATIVE SCHEME FOR CONTROLLING AND CHECKING THE SPREAD OF ANKYLOSTOMIASIS IN ANTIGUA.

1. At the present time the greatest safeguard and the most important factor in preventing the spread of the disease is the small rainfall and irregular intervals at which it often occurs. The ground in the plantations is thus being continually dried and any infection in the soil killed off. In many parts of the island the infection is carried on in the ponds or guts to which the larvae have gained access or by infected persons who act as carriers and spread the disease whenever and wherever the conditions for its existence are favourable. The term "Ground itch" is almost unknown to Antiguans, except by a few old inhabitants who remember a series of wetter seasons when it occurred more commonly, and those who have worked in other islands where the disease is common and the rainfall heavier and where workers on the fields become infected.

What is called "Water fat" is I believe exactly the same as "Ground itch" but many of the people do not recognize the connection between the two, because the ground itch used to occur on the plantation ground itself while water fat occurs in the plantation gutters or drainage areas, ponds and guts where sufficient moisture remains to enable it to exist, while the plantation ground itself is usually too dry. The heavy showers frequently washing any infected top soil into the gutters, guts, ponds or low lying drainage areas which in consequence continue to be the common means of infecting some of the population.

The infection occurring this way is a comparatively mild one and not very frequent for the people aviod places where they know this to exist.

For the above reason the dangers of "Ground itch" or "Water fat" should be taught to all the children in the schools and all the villages and estates circularized with leaflets, pointing out the connection between the two and warning them of its danger.

Until a latrine system is established throughout the island its existence will continue.

2. A trained Microscopist should be attached to the Hospital so that every case entering the Hospital can be examined and if necessary treated before leaving. In every case free treatment should be given until cured, and notice of this posted in the villages and entry to the Hospital permitted when beds are available.

3. Ankylostomiasis should be made a notifiable disease whenever suspected.

The above suggestions are only of a precautionary nature and would in no way serve to eradicate the disease in the island, but under the present conditions they would to some extent check its spread and mitigate its dangers.

Such suggestions are far from ideal in nature and would only be considered if a campaign for complete eradication was not favoured, and where the expense incurred would be out of proportion to the result obtained.

TABLE A.

LIME STONE AREA.

Estate etc.	Adults Examined.	Children under 15 Ex.	No. Adults Infected	No. Children Infected.	o/o of Adults Infected.	o/o of Children Infected.	Total o/o Infected.
Bettys Hope	6	2	...	...	..	...	0·00
Marble Hill	12	...	...	...	..	...	0·00
Cedar Grove	14	36	...	...	..	...	0.00
Thibous	5	5	...	...	...	...	0·00
High Point	7	4	...	.	..	...	0.00
Winthrops	10	4	...	...	...	...	0·00
Barnes Hill	13	16	2	...	15·03	...	6·09
Piggotts'	10	1	2	..	20·00	. .	18.18
St. Mark's School	...	57	...	2	...	3·05	3·05
Millers	2	1	1	...	50·00	. .	33.03
Blackmans	12	3	...	...	..	..	0·00
Donovans	8	9	2	...	25·00	...	11.07
Paynters	6	4	1	..	16·06	..	10·00
Parham	10	40	1	...	10·00	...	2·00
Cottons	4	2	1	...	25·00	..	16.06
Parham New Work	9	1	3	...	33·03	...	30·00
Parham Lodge	4	...	1	...	25·00	...	25.00
Parham Hill	13	...	1	...	7·69	...	7.69
Pares Village	6	3	2	1	33·03	33·03	33·03
Diamonds	4	...	...	...	...	..	0.00
Parrys Old Work	3	4	1	1	33·03	25·00	28.05
Bettys Hope Garden	11	4	...	..	...	.	0·00
Seatons	16	42	...	2	...	4.07	3·04
Willikies	17	16	3	1	17·82	6.02	12·01
Lyons	9	3	1	...	11.01	...	8·03
Newfield	...	6	...	...	...	...	0·00
Gaynors	10	2	1	...	10.00	...	8·03
Montpelier	12	6	3	...	25.00	...	16·06
Freetown	15	24	1	1	6.06	4·15	5.12
Pares & Cochranes	4	0	1		25.00	...	25.00
Totals	252	295	28	8	...	...	...

Total Examined=547 Adults Infected=11·01o/o
Total Infected= 36 Children Infected=2·71o/o
Total o/o=6·05o/o

TABLE A.—(*Continued.*)

CENTRAL PLAIN.

ESTATE etc.	Adults Examined.	Children Under 15 Ex.	No. Adults Infected.	No. Children Infected.	o/o of Adults Infected.	o/o of Children Infected.	Total o/o Infected.		
Grays Farm ...	57	103	11	3	19·29	2·9	8·7		
Tomlinsons ..	4	...	...	...	...	...	0·0		
Potters ..	21	8	6	1	28·57	12·5	24·1		
Central Factory ...	107	15	18	.	16·8	...	13·9	(Factory hands	15·12o/o.)
Lebanon ..	28	24	2	2	7.1	8·3	7·69		
Buckleys ...	21	14	6	...	28·5	...	17·1	Total Examined	689
Freemanville ...	10	23	...	1	...	4·3	3·03	Total Infected	84
All Saints ...	24	51	4	1	16·6	1·96	6·6	Adults Infected	19·1o/o
Sweets ..	20	74	5	8	25·0	10·8	13·8	Children under 15	
Delaps ..	29	3	11	...	37·9	...	34·3	Infected	5·4o/o
Bethesda ...	19	34	2	3	10·52	8·82	9·4	Total o/o	12·19o/o
Totals ...	340	349	65	19	...	...	...		

VOLCANIC AREA.

ESTATE etc.	Adults Examined.	Children Under 15 Ex.	No. Adults Infected.	No. Children Infected.	o/o of Adults Infected.	o/o of Children Infected.	Total o/o Infected.		
Ebenezer ...	8	2	1	1	12·5	50·0	20·0		
Jennings ...	29	36	14	10	48·2	27·7	36·9		
Bolans ...	43	39	25	8	58·1	20·5	40·7		
Blubber Valley ...	6	8	4	...	66·6	...	28·5		
Bendals ..	19	5	9		47·36	.	37·5	Total Examined	486
Hamilton ...	5	7	4	4	80·0	59·1	66·6	Total Infected	156
Brecknock ...	11	11	6	3	54·54	27·27	40·9	Adults Infected	50·47o/o
Sawcolts, etc. ...	25	55	9	13	36·0	23·6	27·5	Children under 15	
Grace Bay, Old Road..	13	74	4	6	30·0	8·1	11·49	Infected	17·87o/o
Liberta ...	53	37	31	4	58·49	10·81	38·8	Total o/o	32·09o/o
Totals ...	212	274	107	49	..	...	...		

TABLE A.—(*Continued.*)

Estate etc.	Adults Examined.	Children under 15 Ex.	No. Adults Infected.	No. Children Infected.	o/o of Adults Infected.	o/o of Children Infected.	Total o/o Infected.	
Falmouth ..	7	13	...	...	...	...	0·00	Total Examined 66 Total o/o 0·00o/o
English Harbour ...	8	38	...	...	...	...	0·00	
Totals ...	15	51	...	...	...	...	0.00	
Urlins ..	12	1	...	...	...	...	...	Total Examined 30 Total o/o 0·00 o/o
Johnson Point ...	1	16	...	...	...	...	...	
Totals ...	13	17	...	...	...	..	...	
Five Islands and Gally Bay ...	16	5	...	...	...	...	...	Total Examined 21 Total o/o 0·00o/o
PUBLIC INSTITUTIONS.								
Prison ...	70	...	18	..	25·07	...	25·07	Total Examined 496 Total Infected 119 Adults Infected 22·76o/o Children under 15 Infec ed 28·57 o/o Total o/o 23.09o/o
Poor House (Males) ...	39	...	1	...	2·05	...	2·05	
„ „ (Females) ...	57	...	5	...	8·07	...	8.07	
Industrial School	...	35	..	13	...	37·01	37·01	
Hospital ...	177	70	43	17	24·29	24·28	24·23	
Lunatic Asylum ...	48	...	22	...	45·08	...	45·08	
Totals ...	391	105	89	30	...	...	..	
Local Cases	118	40	10	1	8·47	2·05	6·09	Total Examined 158 Total Infected 11 Adults Infected 8·47 o/o Children under 15 Infected 2·5o/o Total o/o 6·09o/o Purely Local 2·05o/o
Bishop Mather's School.		221	...	6	...	2·26	2·26	Total Examined 221 Total o/o 2·26o/o

TABLE B.

LIME STONE AREA.

Estate etc.		Males Examined.	Females Examined.	No. of Males Infected.	No. of Females Infected.	o/o of Males Infected.	o/o of Females Infected.
Marble Hill	...	5	7	...	...	...	..
Cedar Grove	. .	27	23	...	...	...	...
Thibous	...	5	5	..	...	...	...
High Point	...	6	5	...	...	...	...
Winthrops	...	7	7	...	...	...	...
Barnes Hill	...	15	14	1	1	6·6	7·1
Piggotts	...	10	1	2	0	20·0	...
St. Mark's School	...	35	22	1	1	2·8	4·5
Millars	...	...	3	...	1	..	33·3
Blackmans	...	8	7	...	...	...	...
Donovans	...	11	6	1	1	9.09	16·6
Paynters Village	...	3	7	1	0	33·3	...
Parham	...	29	21	1	...	3·4	
Parham Lodge	...	4	..	1	...	25·0	...
Parham Hill	...	3	10	1	...	33·3	...
Parham New Work	...	4	6	3	...	75·0	..
Cottons	...	1	5	...	1	...	20·0
Pares Village	...	8	1	3	...	37·5	...
Diamonds	...	3	1	...	...	..	...
Parrys Old Work	...	2	5	...	2	..	40·0
Bettys Hope	...	4	4	...	...	...	...
Bettys Hope Garden	.	10	5	...	. .	...	..
Seatons	...	36	22	2	...	5·5	...
Willikies	...	12	21	3	1	25·0	4·7
Lyons	...	6	6	1	...	16.6	.
Newfield	...	5	1	...	...	...	...
Gaynors	...	3	4	1	...	12·5	..
Montpelier	...	10	8	1	2	10·0	25·0
Freetown	...	14	25	1	1	7·1	4.0
Pares & Cochranes	...	2	2	1	...	50·0	...
Totals	...	293	254	25	11	...	..

Total Examined	547	Males Infected	8·5o/o.
Total Infected	36	Females Infected	4·33o/o.

Total Infected 6·5o/o.

TABLE B.—(*Continued.*)

CENTRAL PLAIN.

Estate etc.	Males Examined.	Females Examined.	No. of Males Infected.	No. of Females Infected.	o/o of Males Infected.	o/o of Females Infected.
Grays Farm etc. ...	77	83	4	10	5·09	12·04
Tomlinsons ...	4	...	...	...	...	...
Potters ...	17	12	4	3	23·05	25·00
Central Factory ...	114	8	18	...	15·08	...
Lebanon ...	22	30	2	2	9·09	6·06
Buckleys ...	12	23	1	5	8·03	21·07
Freemanville ...	16	17	...	1	...	5·08
All Saints ...	25	50	3	2	12.00	4·00
Sweets ...	42	52	7	6	16·06	11·05
De Laps ...	23	9	7	4	30·04	44·04
Bethesda ...	27	26	4	1	14·08	3·84
Totals ...	379	310	50	34	..	...

Total Examined	689
Total Infected	84
Males Infected	13.19o/o
Females Infected	10·09o/o
Total Infected	12·19o/o

VOLCANIC AREA.

Estate etc.	Males Examined.	Females Examined.	No. of Males Infected.	No. of Females Infected.	o/o of Males Infected.	o/o of Females Infected.
Ebenezer ...	7	3	2	...	28·57	...
Jennings ...	27	38	12	12	44·4	31·5
Bolans ...	26	56	12	21	46·1	37·5
Blubber Valley ...	4	10	...	4	...	40·0
Bendals ...	7	17	2	7	28·57	42·35
Hamilton ..	4	8	3	5	75·0	62·5
Brecknock ...	14	8	6	3	42·8	37·5
Sawcolts ...	40	40	16	6	40·0	15·0
Grace Bay, Old Road ...	43	44	7	3	16·2	6·8
Liberta ...	39	51	13	22	33·3	43·1
Totals ...	211	275	73	83	..	...

Total Examined	486
Total Infected	156
Males Infected	34·59o/o
Females Infected	20·19o/o
Total Infected	32·09o/o

TABLE B.—(*Continued*)

Estate etc.	Males Examined.	Females Examined.	No. of Males Infected.	No. of Females Infected.	o/o of Males Infected.	o/o of Females Infected.	
Falmouth	8	12	...	...	...	...	Total Examined 66. Total Infected 0·0o/o.
English Harbour ...	18	28	...	...	...	...	
Totals ..	26	40	...		...	..	
Urlins	6	7	...	..	..	...	Total Examined 30. Total Infected 0.0o/o.
Johnson Point ..	8	9		...	...	..	
Totals ...	14	16		...	...	...	
Five Islands and Galley Bay	8	13	...		...	...	Total Examined 21 Total Infected 0·0o/o.
		PUBLIC	INSTI	TUTION	S.		
Prison ...	64	6	17	1	26·5	16·6	Total Examined 496
Poor House ...	39	57	1	5	2·56	8·7	Total Infected 119
Industrial School ...	35	...	13	...	37·1	...	Males Infected 25·9o/o
Hospital ...	107	140	26	31	24·29	24·28	Females Infected 21·8o/o
Lunatic Asylum ...	13	35	10	12	76·9	34·28	Total Infected 23·9o/o
Totals	258	238	67	52	.	..	
Local Cases	68	90	5	6	7·35	6·66	Total Examined 158 Total Infected 11 Males Infected 7·25o/o Females Infected 6·66o/o Total Infected 6·9 o/o
Bishop Mather's School	221	...	6	...	2·26	..	Total Examined 221 Total Infected 2·26o/o

TABLE C.

BLOOD EXAMINATIONS.

Haemoglobin Examination of 259 *Infected* Cases.

o/o by Haemoglobin Scale within 10 o/o limit.	Number of Cases each within 10 o/o of Scale.	Percentage of Cases each within 10 o/o of Scale.
90o/o +	44	=16·99o/o
80o/o +	147	=56·75o/o
70o/o +	55	=21·23o/o
60o/o +	4	= 1·54o/o
50o/o +	4	= 1·54o/o
40o/o +	2	= ·77o/o
10o/o +	3	= 1·15o/o
Total ...	259	

Haemoglobin Examination of 15 Uninfected Cases.

90o/o +	1	=66·66o/o
80o/o +	14	=93·33o/o
Total	15	

Total Counts of Red Cells per Cubic Millimetre.

1—2 Million per cmm.	1	1·11o/o	No. of Total Counts	90
2—3 Million „ „	6	6·66o/o	Lowest per cmm.	1,770,000
3—4 Million „ „	14	15·05o/o		
4—5 Million „ „	69	76·06o/o		
Total Examined	90			

Differential Blood Counts.

Districts etc.	No. of Cases Examined.	Average Eosinophilia.		
Lime Stone Area ...	1	8o/o	Total Differential Counts	90
Central Plain ...	15	7·07o/o	Highest Eosinophilia Recorded	39o/o
Volcanic Area ...	15	12·93o/o		
Public Institutions ...	39	12·07o/o		
Locals ...	3	10·16o/o		
Matther's School ...	7	9· 9o/o		
Total	80			

TABLE D.

LIME STONE AREA.

Estates etc.	No. of Cases Examined.	Anchylostomes Found.	Ascaris Found.	Trichocephalus Found.	Schistosomum Found.	Strongyloides Found.	Balantidium. Found.	Ciliates undetermined Found.	Amoeba Found.
Marble Hill	12	...	..	6	...	...	...	..	
Cedar Grove	50	...	6	26	...	1	...	...	
Thibous	10	...	2	3	...	...	...	...	
High Point	11	...	2	6	...	...	...	...	
Winthropes	14	...	1	6	...	..	...	...	
Barnes Hill	29	2	4	9	...	4	...	...	
Piggotts	11	2	1	4	...	1	...	...	
St. Marks	57	2	12	22	...	1	...	...	
Millers	3	1	...	2	...	...	...	...	
Blackmans	15	...	...	3	...	3	...	...	
Donovans	17	2	4	8	...	2	...	...	
Paynters	10	1	5	5	...	1	...	...	
Parham	51	1	21	33	...	1	...	...	Muscid Larvae
Parham Lodge	4	1	1	...	...	...	..	...	
Parham Hill	13	1	1	3	...	...	...	...	
Cottons	6	1	2	2	...	...	...	...	
Parham New Works	10	3	...	5	...	...	...	.	
Pares Village	9	3	...	5	...	1	...	...	
Diamonds	4	...	...	...		1	...	...	
Parrys Old Work	7	2	1	1	...	2	...	...	
Bettys Hope	8	...	2	1	...	...	...	...	
Bettys Hope Garden	15	...	2	2	...	2	...	...	
Seatons	58	2	6	13	...	1	...	...	
Willikies	33	4	13	10	...	3	..	...	
Lyons	12	1	2	6	...	1	...	...	
Newfield	6	...	2	4	...	...	...	...	
Gaynors	12	1	1	2	...	...	...	...	
Montpelier	18	3	7	5	...	2	...	...	
Freetown	39	2	7	8	...	...	...	...	
Pares & Cockranes	4	1	...	...	...	..	...	...	
	547	36	105	200	...	27	...	...	...

Total Examined	547	Trichocephalus Found	200	Balantidium Found	0
Ankylostomes Found	36	Schistosomum Found	0	Amoeba Found	0
Ascaris Found	105	Strongyloides Found	27	Cases nothing found	252

TABLE D.—*Continued.*

CENTRAL PLAIN.

Estates, etc.	No. of Cases Examined.	Ankylostomes Found.	Ascaris Found.	Trichocephalus Found.	Schistosomum Found.	Strongyloides Found.	Balantidium Found.	Ciliates undetermined Found	Amoeba Found.
Grays Farm etc. ..	160	14	80	116	..	14	...	1	1
Tomlinsons ...	4	...		..	...	...	...	...	
Potters .	29	7	1	16	...	7	...	...	
Central Factory ...	122	18	12	39	1	15	...	...	
Lebanon ...	52	4	13	17	...	2	...	...	
Buckleys ...	35	6	18	13	...	1	...	...	
Freemanville ..	33	1	6	16	...	3	...	...	
All Saints ...	75	5	32	28	1	6	...	...	Muscid Larvae.
Sweets ...	94	13	51	42	...	8	...	...	
De Laps ..	32	11	3	5	...	4	...	...	
Bethesda ..	53	5	8	12	1	3	..	...	
	689	84	224	304	3	63	...	1	1

Total Examined	689
Ankylostomes Found	84
Ascaris Found	224
Trichocephalus Found	304
Schistosomum Found	3
Strongyloides Found	63
Balantidium Found	0
Undetermined Ciliates	1
Amoeba Found	1
Cases nothing Found	225

VOLCANIC AREA.

Ebenezer ...	10	2	3	3	..	1	...	...	
Jennings ...	65	24	21	39	...	2	...	...	
Bolans ...	82	33	35	43	4	5	...	2	
Blubber Valley ...	14	4	10	7	...	...	...	...	
Bendals ...	24	9	10	12	...	2	...	...	
Hamilton ...	12	8	11	8	1	1	...	...	
Brecknock ...	22	9	11	10	...	1	...	...	
Sawcolts ...	80	22	36	31	7	5	...	...	
Grace Bay, etc. ...	87	10	27	39	...	4	...	...	
Liberta ...	90	35	41	44	13	7	2	...	Muscid Larvae 3
	486	156	205	236	25	28	2	2	

Total Examined	486
Ankylostomes Found	156
Ascaris Found	205
Trichocephalus Found	236
Schistosomum Found	25
Strongyloides Found	28
Balantidium Found	2
Amoeba Found	1
Undetermined Ciliates	2
Cases nothing Found	72

TABLE D.—(*Continued.*)

	No. of Cases Examined.	Ankylostomes Found.	Ascaris Found.	Trichocephalus Found.	Schistosomum Found.	Strongyloides Found.	Balantidium Found.	Ciliates undetermined Found.	Amoeba Found.
Falmouth ...	20	...	3	9	...	1	...	...	...
English Harbour ...	46	...	14	24	...	...	...	...	...
Totals ...	66	...	17	33	...	1	...	...	...

Total Examined	66	Trichocephalus Found	33	Balantidium Found	0
Ankylostomes Found	0	Schistosomum Found	0	Undetermined Ciliates	0
Ascaris Found	17	Strongyloides Found	1	Amoeba Found	0
		Cases nothing Found	25		

	No. of Cases Examined.	Ankylostomes Found.	Ascaris Found.	Trichocephalus Found.	Schistosomum Found.	Strongyloides Found.	Balantidium Found.	Ciliates undetermined Found.	Amoeba Found.
Urlings ...	13	...	2	5	...	2	...	...	...
Johnson Point ...	17	...	1	3	...	...	...	...	...
Totals ...	30	...	3	8	...	2	...	...	...

Total Examined	30
Ankylostomes Found	0
Ascaris Found	3
Trichocephalus Found	8
Schistosomum Found	0
Strongyloides Found	2
Balantidium Found	0
Undetermined Ciliates	0
Amoeba Found	0
Cases nothing Found	20

	No. of Cases Examined.	Ankylostomes Found.	Ascaris Found.	Trichocephalus Found.	Schistosomum Found.	Strongyloides Found.	Balantidium Found.	Ciliates undetermined Found.	Amoeba Found.
Five Islands and Galley Bay ...	21	...	8	17	...	3	...	...	...

Total Examined	21	Trichocephalus Found	17	Balantidium Found	0
Ankylostomes Found	0	Schistosomum Found	0	Undetermined Ciliates	0
Ascaris Found	8	Strongyloides Found	3	Amoeba Found	0
		Cases nothing Found	2		

TABLE D.—(*Continued.*)

PUBLIC INSTITUTIONS.

	No. of cases Examined.	Ankylostomes Found.	Ascaris Found.	Trichocephalus Found.	Schistosomum Found.	Strongyloides Found.	Balantidium Found	Ciliates undetermined Found.	Amoeba Found.	
Prison ...	70	18	9	41	...	2	...	...	...	*1 Oxyuris
Poor House ...	96	6	11	28	...	8		1	...	
Industrial School ...	35	13	81	23	.	2	...	1	...	
Hospital ...	247	60	74	135	6	26	...	...	2	2 Muscid Larvae
Lunatic Asylum ...	48	22	4	31	...	6	...	...	...	
Totals ...	496	119	109	258	6	44	...	2	2	

Total Examined	496	Trichocephalus Found	258		
Ankylostomes Found	119	Schistosomum Found	6	Undetermined Ciliates	2
Oxyuris Found	1	Strongyloides Found	44	Amoeba Found	2
Ascaris Found	109	Balantidium Found	0	Cases nothing Found	129.

	No. of cases Examined.	Ankylostomes Found.	Ascaris Found.	Trichocephalus Found.	Schistosomum Found.	Strongyloides Found.	Balantidium Found	Ciliates undetermined Found.	Amoeba Found.	
Local Cases ...	158	11	47	92	4	12	...	1	...	

Total Examined	158	Schistosomum Found	4		
Ankylostomes Found	11	Strongyloides Found	12		
Ascaris Found	47	Balantidium Found	0	Amoeba Found	1
Trichocephalus Found	92	Ciliates Undetermined	1	Cases nothing Found	48

	No. of cases Examined.	Ankylostomes Found.	Ascaris Found.	Trichocephalus Found.	Schistosomum Found.	Strongyloides Found.	Balantidium Found	Ciliates undetermined Found.	Amoeba Found.	
Bishop Matther's School ...	221	6	158	209	...	14	1	...	...	2 Muscid Larvae

Total Examined	221
Ankylostomes Found	6
Ascaris Found	158
Trichocephalus Found	209
Schistosomum Found	0
Strongyloides Found	14
Balantidium Found	1
Undetermined Ciliates	0
Amoeba Found	0
Cases nothing Found	6

*From Dominica.

SUMMARY.

	Lime Stone Area.	Central Plain.	Volcanic Area.	Falmouth District.	Johnson Point District.	Galley Bay District.	Public Institutions.	Local Cases.	Bishop Mather's School.
Total Examined ..	547	689	486	66	30	21	496	158	221
Ankylostomes Found ...	36	84	156	...	...	...	119	11	6
Oxyuris Found ...	...	...	...	...	...	...	1	...	...
Ascaris Found ..	105	224	205	17	3	8	109	47	158
Trichocephalus Found ...	200	304	236	33	8	17	258	92	209
Schistosomum Found ...	...	3	25	...	...	...	6	4	...
Strongyloides Found ...	27	63	28	1	2	3	44	12	14
Balantidium Found ...	..	...	2	...	...	...	...	...	1
Ciliates Undetermined ...	...	1	2	...	...	...	2	1	...
Amoeba Found ...	...	1	1	...	...	...	2	1	...
Cases nothing Found ...	252	225	72	25	20	2	129	48	6

INTESTINAL PARASITES FOUND DURING INVESTIGATION.

Nematodes.

Ankylostomum Duodendale.
Necator Americanus.
Ascaris Lumbricoides.
Trichiuris trichiura (T. Dispar.)
Oxyuris Vermicularis (Dominica 1 Case).
Strongyloides Stercoralis.

Trematodes.

Schistosomum Mansoni.

Protozoa.

Amoeba Coli.
Balantidium Coli.

Gaylord Bros.
Makers
Syracuse, N. Y.
PAT. JAN. 21, 1908

YE 14751